

Hole's Human Anatomy and Physiology

Twelfth Edition

Shier ♦ Butler ♦ Lewis

Chapter 3 Cells



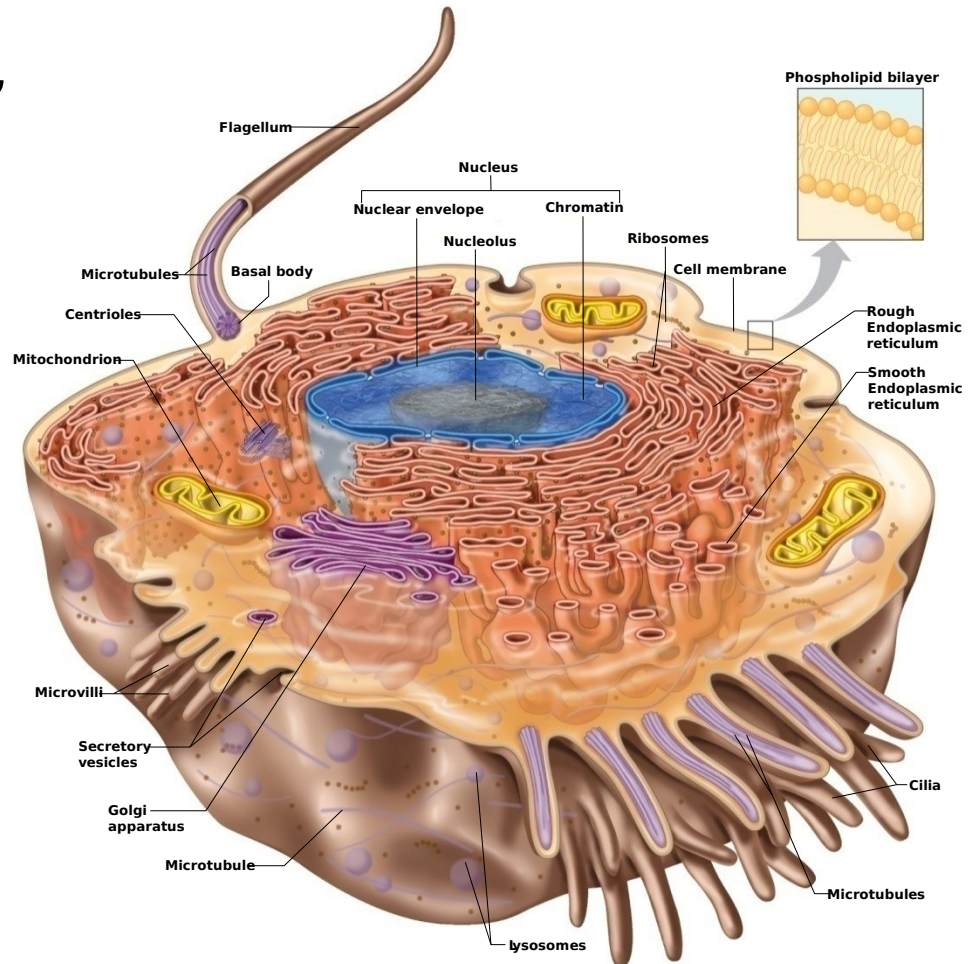
3.1: Introduction

- The basic organizational structure of the human body is the cell.
- There are 50-100 trillion cells in the human body.
- Differentiation is when cells specialize.
- As a result of differentiation, cells vary in size and shape due to their unique function.

3.2: A Composite Cell

Copyright © The McGraw-Hill Companies, Inc. Permission required for reproduction or display.

- Also called a 'typical' cell
- Major parts include:
 - Nucleus
 - Cytoplasm
 - Cell membrane

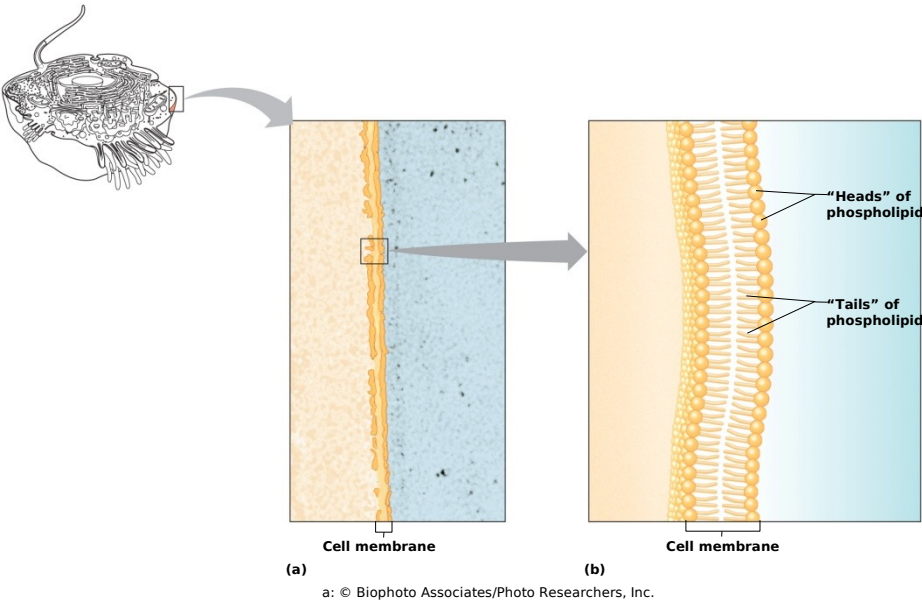


Cell Membrane (aka Plasma Membrane)

- Outer limit of the cell
- Controls what moves in and out of the cell
- Selectively permeable
 - Phospholipid bilayer
 - Water-soluble “heads” form surfaces (hydrophilic)
 - Water-insoluble “tails” form interior (hydrophobic)
 - Permeable to lipid-soluble substances
- Cholesterol stabilizes the membrane
- Proteins:
 - Receptors
 - Pores, channels and carriers
 - Enzymes
 - CAMS
 - Self-markers

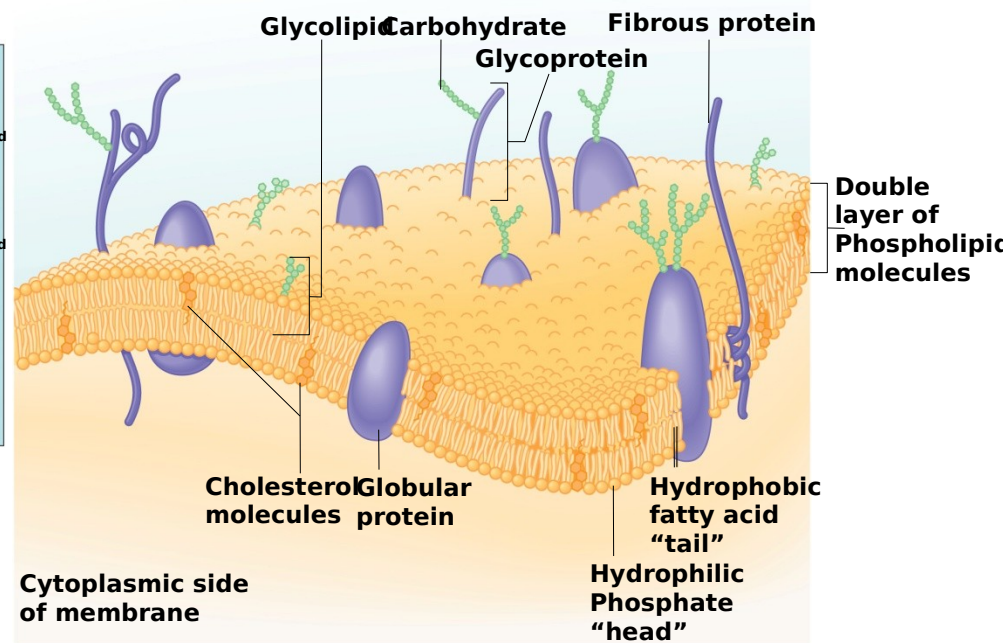
Cell Membrane

Copyright © The McGraw-Hill Companies, Inc. Permission required for reproduction or display.



Copyright © The McGraw-Hill Companies, Inc. Permission required for reproduction or display.

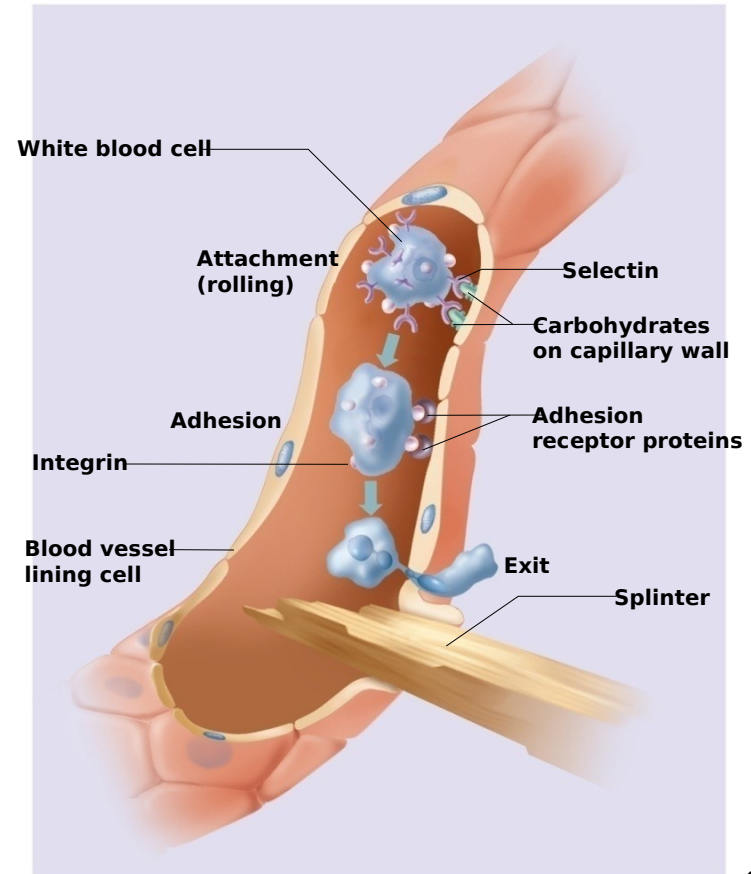
**Extracellular side
of membrane**



Cell Adhesion Molecules (CAMs)

Copyright © The McGraw-Hill Companies, Inc. Permission required for reproduction or display.

- Guide cells on the move
 - Selectin – allows white blood cells to “anchor”
 - Integrin – guides white blood cells through capillary walls
 - Important for growth of embryonic tissue
 - Important for growth of nerve cells



Cytoplasm

- Cytosol = water
- Organelles = solids

Cytoplasm is really like a Jello fruit salad where the Jello is the cytosol and the fruits (oranges, grapes, bananas, maybe walnuts, etc.) are the organelles.

Organelles

Endoplasmic Reticulum (ER)

- Connected, membrane-bound sacs, canals, and vesicles

- Transport system

- **Rough ER**

- Studded with ribosomes

- **Smooth ER**

- Lipid synthesis

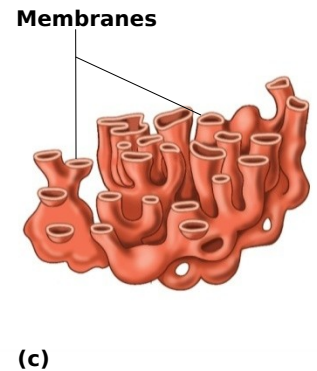
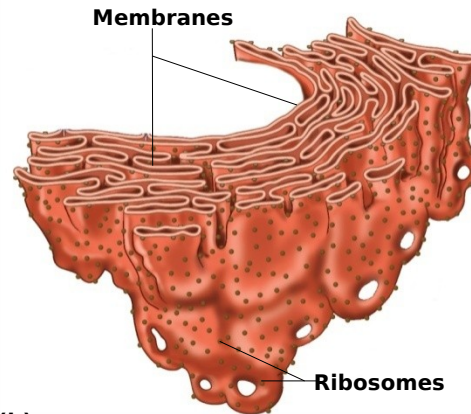
- Added to proteins arriving from rough ER

- Break down of drugs

- Free floating or connected to ER

- Provide structural support and enzyme activity

Copyright © The McGraw-Hill Companies, Inc. Permission required for reproduction or display.



Ribosomes

Organelles

Golgi apparatus

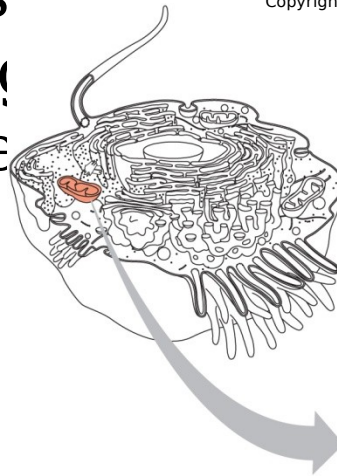
- Stack of flattened, membranous sacs
- Modifies, packages and delivers proteins

Vesicles

- Membranous sacs
- Store substances

Mitochondria

- Membranous sacs with inner partitions
- Generate energy

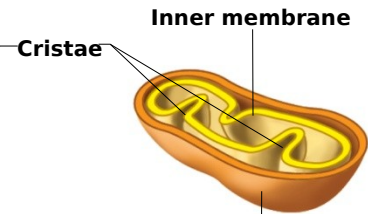


Copyright © The McGraw-Hill Companies, Inc. Permission required for reproduction or display.



(a)

a: © Bill Longcore/Photo Researchers, Inc.



(b)

Organelles

Lysosomes

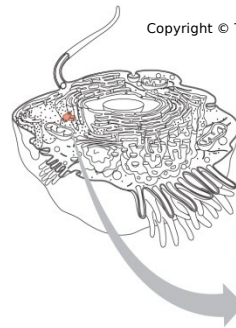
- Enzyme-containing sacs
- Digest worn out cell parts or unwanted substances

Peroxisomes

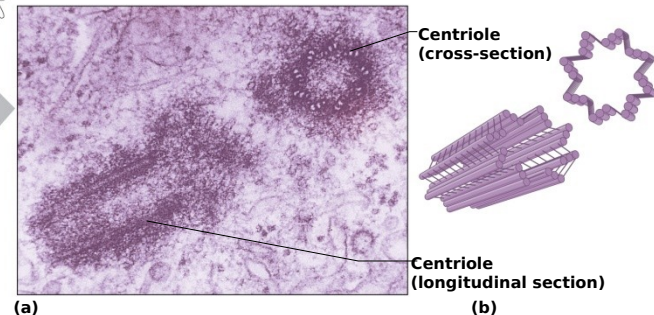
- Enzyme-containing sacs
- Break down organic molecules

Centrosome

- Two rod-like centrioles
- Used to produce cilia and flagella
- Distributes



Copyright © The McGraw-Hill Companies, Inc. Permission required for reproduction or display.



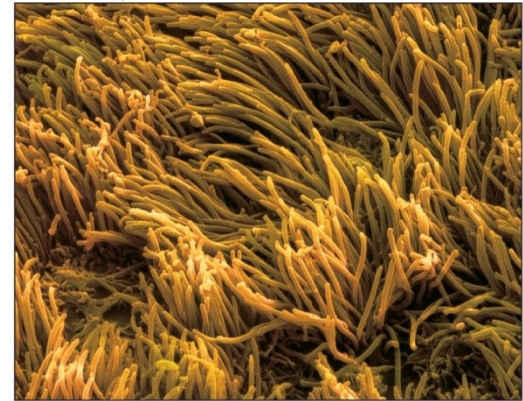
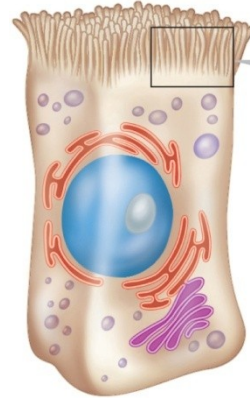
ng

Organelles

Copyright © The McGraw-Hill Companies, Inc. Permission required for reproduction or display.

Cilia

- Short hair-like projections
- Propel substances on cell surface

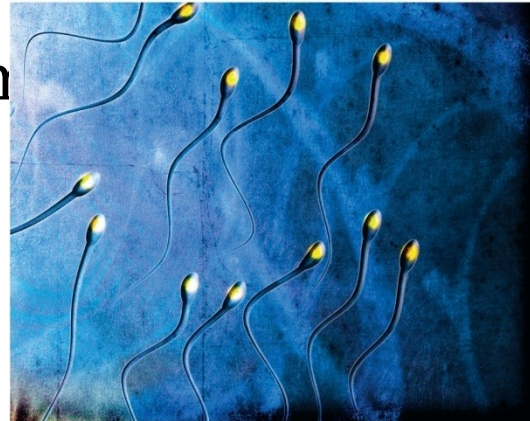


(a)

a: © Oliver Meckes/Photo Researchers, Inc.

Flagellum

- Long tail-like projection
- Provides motility to sperm



© Colin Anderson/Brand X/CORBIS

Organelles

Microfilaments and microtubules

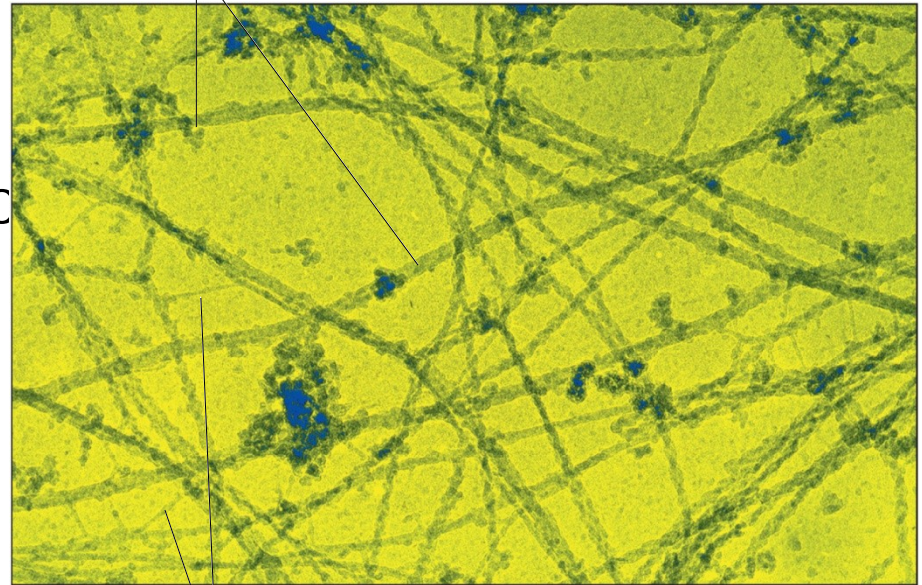
- Thin rods and tubules
- Support cytoplasm
- Allows for movement of organelles

Inclusions

- Temporary nutrients and pigments

Copyright © The McGraw-Hill Companies, Inc. Permission required for reproduction or display.

Microtubules



Microfilaments

© M. Schliwa/Visuals Unlimited